NOTES ON SOME FLEAS (SIPHONAPTERA) FROM AMAZONAS AND BAHIA STATES, BRAZIL[1, 2, 3]

Michael W. Hastriter[4], Norman E. Peterson[5]

ABSTRACT: Ten species of fleas collected from 19 mammalian host species are reported from the Brazilian States of Amazonas and Bahia. Validity of previously used taxonomic characters are considered and new ones presented.

U.S. Army Medical personnel collected small mammals in Brazil, for biomedical research, from August 1980 to February 1986. Collections included 548 fleas (10 species) from 164 mammals (19 species). Although the majority of specimens were collected from Bahia State, some were collected from the State of Amazonas where few records have been established. The purpose of this paper is to establish new distributional records, to present relevant characters to distinguish several species of *Polygenis* females, and to clarify an anatomical inconsistency published by Cerqueira and Linardi (1976) distinguishing *Polygenis tripus* (Jordan 1933) from *P. rimatus* (Jordan 1932). Data representing host/parasite associations, collection localities, and remarks on individual flea species follows. Mammal classifications follow Wilson and Reeder (1993).

Study Sites: Abbreviated collection localities and ecological data are provided as follows:

STATE OF AMAZONAS –

Loc. A: Carauarí, Gaviãe - 4°52´S 66°52´W, elev: 100 meters.

Loc. B: Tefé, Cidade Juruá - 3°23´S 66°01´W, elev: 100 meters. Collected in the Amazon Basin along the Jurua River in or adjacent to humid tropical forest where the commercially important trees have been removed.

STATE OF BAHIA –

Loc. C: Caatinga de Moura - 10°59´S 40°45´W, elev: 600 meters. Collected along streams, or marsh in the dry Caatinga region of northeastern Brazil.

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[1] Received January 9, 1997, Accepted February 24, 1997.

[2] Supported by U.S. Army Medical Research and Development Command Research Contract DAMD 17-88-H-8008.

[3] The opinions contained herein are those of the authors and should not be construed as official or reflecting the views of the Department of the Army.

[4] Monte L. Bean Life Science Museum, Brigham Young University, 290 MLBM, P.O. Box 20200, Provo, Utah 84602-0200.

[5] U.S. Army Medical Research Unit, Brazil, Unit 3501, APO AA 34030.

Loc. D: Corte de Pedra - 13°20´S 39°28´W, elev: 200-450 meters.
Loc. E: Gandu - 13°47´S 39°35´W, elev: 300 meters.
Loc. F: Três Braços - 13°32´S 39°45´W, elev: 200-550 meters. Collected in the Atlantic Forest Region approximately 150 kilometers southeast of Salvador. This area has steep hills and valleys where cacao is grown. The region was originally covered with a humid tropical forest which has been cleared for agricultural purposes. Tall forests remain only on the hilltops. Banana and cacao plantations, secondary scrub, pasture and varying degrees of secondary forest are close to the houses.

RESULTS AND DISCUSSION

Mammalian species are arranged alphabetically followed by the species of fleas in descending order of abundance on each specific host. The numbers following the flea species indicate the number of fleas collected per number of hosts that harbored one or more fleas. *Metachirus nudicaudatus* (21%), *Proechimys iherinqi* (18%), and *Bolomys* sp. (18%) comprised 57% of the mammals which harbored fleas.

Mammalia

Carnivora (Canidae): *Cerdocyon thous* (Linnaeus, 1766): *Adoratopsylla intermedia intermedia* (1/1), *Ctenocephalides felis felis* (1/1).

Didelphimorphia (Didelphidae): *Didelphis albiventris* Lund, 1840: *A. i. intermedia* (9/11), *Adoratopsylla antiquorum antiquorum* (2/11), *Polygenis bohlsi jordani* (2/11), *Polygenis pradoi* (1/11), *Polygenis rimatus* (1/11), *Polygenis roberti roberti* (1/11); *Didelphis marsupialis* Linnaeus, 1758: *A. i. intermedia* (3/3), *P. r. roberti* (1/3); *Marmosa murina* (Linnaeus, 1758): *A. i. intermedia* (2/3), *A. a. antiquorum* (1/3; *Marmosa* sp.: *A. a. antiquorum* (1/1); *Marmosops parvidens* Tate, 1931: *A. a. antiquorum* (1/1); *Micoureus demerarae* (Thomas, 1905): *A. a. antiquorum* (2/3), *P. r. roberti* (1/3); *Metachirus nudicaudatus* (Desmarest, 1817): *A. i. intermedia* (35/35), *A. a. antiquorum* (2/35); *Monodelphis americana* (Muller, 1776): *A. a. antiquorum* (4/4); *Philander opossum* (Linnaeus, 1758): *A. i. intermedia* (2/2).

Rodentia (Cavidae): *Cavia aperea* Erxleben, 1777: *Polygenis tripus* (3/4), *P. r. jordani* (2/4), *A. i. intermedia* (1/4).

Rodentia (Echimyidae): *Proechimys iheringi* Thomas, 1911: *Hectiella nitidus* (27/29), *A. i. intermedia* (2/29), *P. pradoi* (1/29); *Proechimys longicaudatus* (Rengger,1830): *Gephyropsylla klagesi samuelis* (3/3).

Rodentia (Muridae): *Bolomys lasiurus* (Lund, 1841): *P. rimatus* (2/5) *A. i. intermedia* (1/5), *P. pradoi* (1/5), *P. tripus* (1/5); *Bolomys* sp.: *P. pradoi* (17/25), *P. rimatus* (6/25), *A. i. intermedia* (2/25), *A. a. antiquorum* (1/25), *P. tripus* (1/25); *Holochilus brasiliensis* (Desmarest, 1819): *G. k. samuelis* (1/2), *P. pradoi* (1/2); *Nectomys squamipes* (Brants, 1897): *P. r. roberti* (5/6), *A. a. antiquorum* (1/6), *A. i. intermedia* (1/6); *Oryzomys capito* (Olfers, 1818): *P. r. roberti* (2/2), *H. nitidus* (1/2); *Oryzomys subflavus* (Wagner, 1842): *A. a. antiquorum* (2/2); *Oryzomys* sp.: *P. r. roberti* (3/7), *A. i. intermedia* (2/7), *A. a. antiquorum* (1/7), *P. b. jordani* (1/7); *Oxymycterus* sp.: *P. rimatus* (14/14), *P. r. roberti* (2/14), *A. a. antiquorum* (1/14); *Rhipidomys masticalis* (Lund, 1840): *A. a. antiquorum* (1/1).

Siphonaptera

The number of male and female fleas found on any particular host species precedes the host for each locality at which they were collected.

Pulicidae: *Ctenocephalides felis felis* (Bouché, 1835) — Loc. C: 1♀, *C. thous.*

Ctenophthalmidae: *Adoratopsylla (Adoratopsylla) antiquorum antiquorum* (Rothschild, 1904) — Loc. D: 2♂,3♀, *M. americana*; 1♀ each, *M. demerarae*, *Marmosa* sp., *N. squamipes*, *O. subflavus*, and *Oryzomys* sp.; Loc. F: 4♀, *M. demerarae*; 2♂, 1♀, *M. murina*; 2♂, *M. nudicaudatus*; 2♀, *D. albiventris*; 1♂, 1♀, *O. subflavus*; 1♂ each, *M. parvidens*, *Marmosa* sp., *Oxymycterus* sp., and *R. masticalis*; 1♀, *Bolomys* sp.

REMARKS: The known distribution of *A. a. antiquorum* extends from Venezuela (Tipton and Machado-Allison, 1972) to southeastern Brazil. Guimarães (1972) found this species widely distributed in the Brazilian States of Alagoas, Ceara, Bahia, and Pernambuco mainly on marsupial hosts and sporadically on various species of *Bolomys*, *Oryzomys*, and *Proechimys*.

Adoratopsylla (Tritopsylla) intermedia intermedia (Wagner, 1901) — Loc. C: 2♂, *C. aperea*; 3♂, *B. lasiurus*; Loc. D: 24♂, 4♀, *M. nudicaudatus*; 15♂,18♀, *D. marsupialis*; 1♀ each, *C. thous*, *N. squamipes*, and *Oryzomys* sp.; Loc. E: 67♂, 46♀, *M. nudicaudatus*; 2♂, 3♀, *D. albiventris*; 1♂, 1♀, *Bolomys* sp.; 1♂, 1♀, *M. murina*; 1♂, *Oryzomys* sp.; Loc. F: 61♂, 47♀, *M. nudicaudatus*; 14♂, 10♀, *D. albiventris*; 1♂, 2♀, *P. opossum*; 1♂, 1♀, *P. iheringi.*

REMARKS: *Adoratopsylla i. intermedia* has the broadest distribution of all the species of Adoratopsylla, occurring from Venezuela south through Argentina on marsupials. It comprised 60 percent (329/548) of all species collected. *Metachirus nudicaudatus* and *D. albiventris* were the predominant hosts in Bahia. Ninety-six percent of the combined species collected in the genera *Metachirus* and *Didelphis* were infested with *A. i. intermedia*. Tipton and Machado-Allison (1972) reported large numbers of *A. i. intermedia* from *Didelphis azarae* in Venezuela, while Guimarães (1972) found none on *D. azarae* in Bahia. It should be noted that *D. azarae* is synononomized with *D. albiventris* in Venezuela and with *Didelphis aurita* in Bahia according to Hershkovitz (1969) and Wilson and Reeder (1993), respectively. Thus, two closely related marsupials, *D. albiventris* and *D. aurita*, do not appear to harbor the same common flea, *A. i. intermedia.*

Rhopalopsyllidae: *Gephyropsylla klagesi samuelis* (Jordan and Rothschild, 1923) — Loc. A: 3♂, 1♀, *H. brasiliensis*; 2♂, 1♀, *P. longicaudatus*; Loc. B: 3♀, *P. longicaudatus.*

REMARKS: Linardi and Guimarães (1993) erected *Gephyropsylla*, a subgenus established by Smit (1987) under *Polygenis*, to full generic status. Although *G. k. samuelis* has been reported from Costa Rica, Panama, Venezuela, Colombia, Ecuador, Bolivia and Brazil, this is the first record of its presence

south of the Amazon River in the State of Amazonas. Specimens were collected from *H. brasiliensis* and *P. longicaudatus* along the corridor of the Juruá River. According to a study of Venezuelan populations of *G. k. samuelis* and the nominate subspecies by Machado-Allison and McLure (1963), both prefer species of *Proechimys* as hosts.

Hectiella nitidus (Johnson, 1957) — Loc. F: 32♂, 41♂, *P. iheringi;* 1♀, *O. capito.*

REMARKS: *Hectiella,* once considered a subgenus of *Polygenis,* was erected to full generic status by Linardi and Guimarães (1993). *Hectiella nitidus* was found on 27 of 29 *P. iheringi* examined in the area of Três Braços, while only a single specimen (probable accidental association) was found on *O. capito.* Although the species was originally described from two females by Johnson (1957) and collected from *D. marsupialis* in Bahia, the male was later described by Linardi and Nagem (1980) from *Proechimys dimidiatus* in Caratinga, State of Minas Gerais, Brazil. Botelho, et al. (1981) also collected specimens from the latter area and determined species of *Proechimys* as the preferred host. In the State of Bahia, *P. iheringi* is clearly the preferred host for this species and few other flea species were collected from this host. The distribution of *H. nitidus* is restricted to Brazil.

Polygenis (Polygenis) bohlsi jordani (Costa Lima, 1937) — Loc. c: 1♂, 1♀, *C. aperea;* Loc. E: 2♂, 1♀, *D. albiventris;* 1♂, *M. nudicaudatus;* 1♀, *Oryzomys* sp.

REMARKS: This subspecies was collected on the southern edge of its known range of northeastern Brazil. *Polygenis b. jordani* displays little host specificity, occurring on numerous host species. Guimarães (1972) found this species the most ubiquitous flea from areas collected in Bahia State to northeastern Brazil and indicated a close association with domestic rats. Because of its potential for transmitting plague between the urban and sylvatic mammalian reservoirs, this species should be considered important during plague outbreaks in Brazil.

Polygenis (P.) pradoi (Wagner, 1937) — Loc. D: 1♂,10♀, *Bolomys* sp.; Loc. F: 8♂,11♀, *Bolomys* sp.; 2♂,1♀, *B. lasiurus;* 1♂ each, *D. albiventris* and *P. iheringi.*

REMARKS: Botelho and Linardi (1980) collected *P. (P.) pradoi* primarily from *B. lasiurus,* and indicated the most northern limit as Caratinga County, Minas Gerais, Brazil. Our collections (also found on *B. lasiurus*) extend the species range north to Corte de Pedra and Três Braços, Bahia. It is reported to range south to Buenos Aires Province, Argentina, and a disjunct population is also reported in southwestern Colombia by Mendez (1977). Linardi (1979) thinks a complex of *P. (P.) pradoi* along coastal Brazil needs revision. Populations from Colombia and those extending from Brazil to Argentina should also be included in such a revision.

Polygenis (P.) rimatus (Jordan, 1932) — Loc. C: 1♂, 1♀, *B. lasiurus;* Loc. D: 4♂, 3♀, *Oxymycterus* sp.; 1♂, 1♀, *Bolomys* sp.; Loc. F: 9♂, 9♀, *Oxymycterus* sp.; 4♀, *Bolomys* sp.; 1♂, 1♀, *D. albiventris;* 1♀, *B. lasiurus.*

REMARKS: These collection records constitute the northern range of this species occurring on numerous cricetine rodents. *Polygenis rimatus* females from Bahia State differ from those examined from Argentina. The duct of the spermatheca is characteristically enlarged from its proximal origin to approximately 2/3 its length *(pars dilatata).* The *pars dilatata* has a greater diameter in all specimens examined from Argentina than those from Bahia, but no portion is sclerotized. The Bahia State populations of *P. rimatus* possess a distinctly sclerotized U-shaped region (Fig. 1) not present in Argentina populations examined. The sclerotization abruptly begins, and diminishes as it traverses towards the spermatheca. Maceration alters the position and orientation of this structure, but the evident rigidity of the obvious sclerotization maintains the consistently uniform U-shape. The posterior margin of the 7th sternite is also gently rounded, without lobes, undulations, or angular features.

Many specimens of the following species borrowed from the British Museum that might be confused with *P. rimatus (P. acodontus, P. axius axius, P. axius proximus, P. brachinus, P. litargus, P. occidentalis occidentalis,* and *P. tripus)* were examined. Although the spermathecal ducts may vary within each species, only *P. rimatus, P. tripus* and *P. brachinus* have an enlarged *pars dilatata.* Excluding *P. rimatus,* neither possessed an area of sclerotization except for a population of *P. tripus* from Salta Province, Argentina. The latter specimens were illustrated by Smit (1987) to separate *P. tripus* from all the species above. Of the material examined from the British Museum (Argentina, Bolivia and Brazil), only the Salta Province, Argentina population possessed this character, negating its usefulness to distinguish *P. tripus* from others. In general, little or no expansion or sclerotization of the duct of the spermatheca exists in *P. acodontus* (Argentina), *P. axius axius* (Argentina), *P. litargus* (Peru), and *P. o. occidentalis* (Brazil). These observations might be considered for future revisionary work on *Polygenis,* which is badly needed.

Polygenis (P.) roberti roberti (Roths., 1905) — Loc. D: 5♂, 4♀, *Oryzomys* sp.; 3♀, *N. squamipes;* 1♂, 1♀, *M. demerarae;* 1♀, *D. marsupialis;* 1♂, *Oxymycterus* sp.; Loc. F: 2♂, *N. squamipes;* 2♀, *O. capito:* 1♀ each, *D. albiventris, H. brasiliensis,* and *Oxymycterus* sp.

REMARKS: Linardi (1977) indicated this species to be rather host specific, although it was sporadically collected on five mammalian genera. Specimens were most frequently collected on species of *Oryzomys.*

Polygenis (P.) tripus (Jordan, 1933) — Loc. C: 4♂, *C. aperea;* Loc. F: 1♀, *Bolomys* sp.

REMARKS: This species was reported by Linardi, et al. (1984) and Cerqueira and Linardi (1977, 1981) as the most common *Polygenis* species in

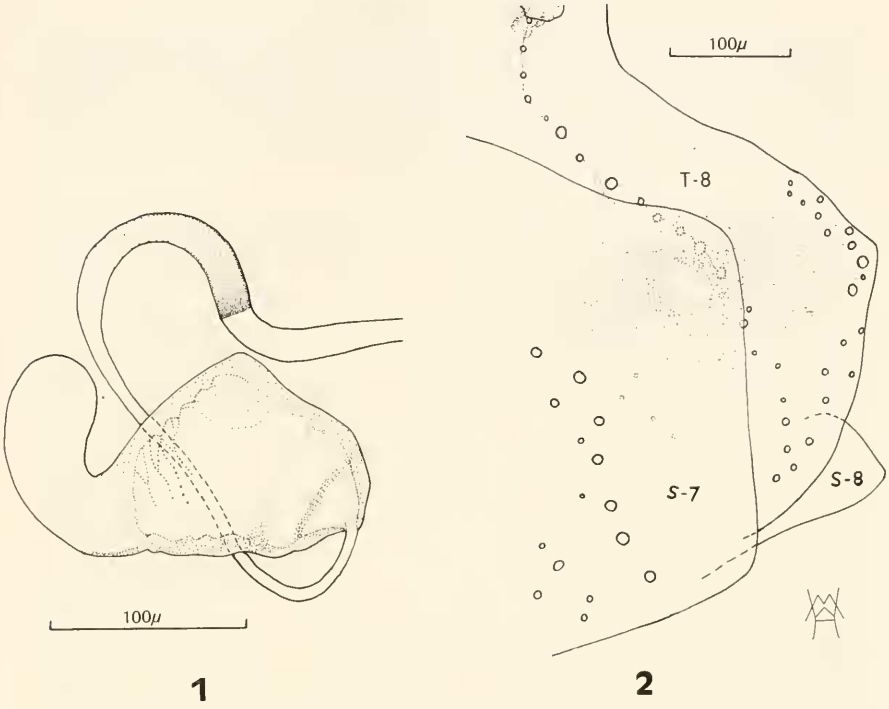

Fig. 1. *Polygenis rimatus*, spermatheca and sclerotized *pars dilatata*. Fig. 2. *P. tripus*, eighth tergite illustrating "scale-like clear spot" beneath seventh sternite.

Belo Horizonte, Minas Gerais, Brazil on *Bolomys lasiurus*. It is also commonly found on species of *Oryzomys*, but none were collected from either of these usual host species in Bahia. Cerqueira and Linardi (1976) reported a diagnostic feature for distinguishing *P. tripus* females from those of *P. rimatus*. The latter paper indicates (both in text and in photo caption) a "scale-like clear spot" in the integument of the 7th sternite, and references the same morphological feature on the 8th sternite in the English summary. This unique character, keenly observed and reported by these authors, is located on neither the 7th nor 8th sternite, but rather on the 8th tergite, occurring just beneath the dorso-caudal angle of the 7th sternite (Fig. 2). This clear area occurs within a heavily sclerotized region of the 8th tergite bearing coarse reticulations in the vicinity of the clear area. The clarity of this spot in specimens examined from Brazil, Argentina, and Bolivia was distinct in some specimens and obscure in others. This seemed to be a function of proper specimen preparation (not over, or under-clearing).

ACKNOWLEDGMENTS

Grateful appreciation is extended to Robert E. Lewis, Iowa State University, Nancy Adams, Curator of the Siphonapteran collection, U.S. National Museum of Natural History, and Theresa Howard, The Natural History Museum, London, England for providing specimens of *Polygenis* for study; to Paulo R. L. Lago, of the Ministry of Health (SUCAM), Brazil, who assisted in mammal and flea collections; and to Clive D. Jorgensen, Glenn E. Haas, and Eustorgio Méndez for providing helpful suggestions with the manuscript.

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